

# **MOISTURE PASSIVATED PLANAR INDEX-GUIDED VCSEL**

## **ABSTRACT**

Systems and methods of passivating planar index-guided oxide vertical cavity surface emitting lasers (VCSELs) are described. These systems and methods address the unique susceptibility of these devices to damage that otherwise might be caused by moisture intrusion into the etch holes that are used 5 to form the index-guiding confinement regions. In one aspect, a VCSEL includes a vertical stack structure having a substantially planar top surface. The vertical stack structure includes a top mirror, a bottom mirror, and a cavity region disposed between the top mirror and the bottom mirror and including an active light generation region. At least one of the top mirror and the bottom mirror has 10 a layer with a peripheral region that is oxidized into an electrical insulator as a result of exposure to an oxidizing agent. The vertical stack structure defines two or more etched holes each extending from the substantially planar top surface to the oxidized peripheral region. Each of the etched holes is moisture passivated by an overlying moisture penetration barrier.